IOWA HIGHWAY RESEARCH BOARD (IHRB)
Minutes of July 25, 2014

Regular Board Members Present

A. Abu-Hawash
K. Jones
R. Younie
S. Okerlund
B. Braun
W. Weiss
D. Miller
P. Assman
K. Mayberry
L. Roehl

Alternate Board Members Present

B. Braun
W. Klaiber
P. Mouw
M. Parizek

Members with No Representation

R. Kieffer
M. Kennerly
D. Schnoebelen

Secretary – V. Goetz

Visitors

Brent Phares	Iowa State University
Yaohua Deng	Iowa State University
Rangan Gopalakrishnan	Iowa State Univeristy
Sunghwan Kim	Iowa State University
Bruce Braun	APWA
Phil Rossbach	HDR
Mike Nop	Iowa Department of Transportation
Max Grogg	FHWA
Chris Cromwell	FHWA
Andy Wilson	FHWA
Patrick Mouw	Ida County
Larry Roehl	Louisa County
Leighton Christiansen	Iowa Department of Transportation
Dave Calman	Iowa Department of Transportation
Jim Nelson	Iowa Department of Transportation

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, July 25, 2014. The meeting was called to order at 9:00 a.m. by Chairperson Kevin Mayberry with an initial number of 10 voting members/alternates at the table.

Minutes

1. **No Agenda Modifications**

2. **Motion to approve Minutes from the May 30, 2014 meeting**

Motion to Approve by 1st B. Younie 2nd D. Miller
Motion carried with 10 Aye, 0 Nay, 0 Abstaining.

*****3 members joined the table. Total voting members = 13**

3. **FINAL REPORT,** *TR-617, "An Adaptive Field Detection Method for Bridge Scour Monitoring Using Motion-Sensing Radio Transponders (RFIDs)", Thanos Papanicolaou, ISU/InTrans, ($210,967)*

BACKGROUND
Scour of the river bed sediment near a bridge pier or abutment results from complex interactions between the approaching stream flow and the bridge structure. If the scour is excessive, it can expose the bridge foundations and thus compromise their stability. Unfortunately, the FWHA estimates more than 150,000 bridges across the United States are vulnerable to scour. Current monitoring methods of scour require personnel to be physically present at the bridge site during the measurements, putting them at risk during a flood event. Additionally, these methods can be expensive, time consuming, and often require traffic control. A remote, yet cost-effective means of monitoring scour is highly desired by DOTs around the country.

OBJECTIVE
The main objective of the study was to develop a comprehensive field detection method for the safe and reliable monitoring, inspection, and life estimation of bridge infrastructure affected by scour.
This was accomplished by integrating the RFIDs with sensing architecture for in-situ scour monitoring and multi-scale modeling to provide real-time, condition assessments that can be used in decision-making for down time, repair costs, and estimating the remaining useful life of critically scoured bridge structures.
The results from this study will ultimately translate to an inexpensive, automated bridge monitoring system with the potential applications for other critical infrastructure, such as dams, levees or other near-shore structures.

Motion to Approve by 1st A. Abu-Hawash. 2nd K. Jones.
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

4. **TR-617, Implementation Discussion:**
   - ✓ This RFID sensor can be read below streambed, this was the main reason for this research. This could be used for major bridges over large streams where if you have a scour critical bridge and you wanted to keep it open in a flood the counter measures would be very costly. This method could provide real time scour monitoring during a flood at a cheaper price then what it would cost to do a conventional scour measure and keep the road open to traffic.

- ✓ The next step in implementation is to find a County or State to put the RFID on a bridge.

Q. Is there a limitation on how big of a stream because of the distance with the antenna?
A. You can read from where the antenna is down to where the RFID sensors are buried about 45 feet.

5. First Round of RFP Review and Discussion for FY15:

1. **IHRB 14-02, "Guidance on Traffic Sign Effectiveness Instillation and Removal"**
   - ✓ The RFP will go out as written.
2. **IHRB 14-03, "Frost Boil Treatments Innovative Construction and Maintenance Techniques"**
   - ✓ The recommendation consensus is to put this project on Hold.
3. **IHRB 14-04, "Feasibility of Gravel Road Recycling"**
   - ✓ A process similar to this has been used on granular shoulders in the field of maintenance we were able to reclaim a lot of miles of granular shoulders.
   - ✓ The RFP will be changed adding granular shoulders to be included.
4. **IHRB 14-05, Estimation of Dyed Fuel Vehicle Usage on Roadways**
   - ✓ The amount of dyed fuel used actually on the road is going to be very minimal. Most dyed fuel is used off road. The biggest issue is the weight of the vehicle that uses the road.
   - ✓ As they investigate the amount of fuel can there also be some investigation on what type of vehicles are using that fuel on the roads.
   - ✓ The County focus group is concentrating on looking at how much of the fuel is actually being used on the roadways. Are we going to tax it or are we going to get anything out of it? Why tax it if we are not on the road?
   - ✓ The recommendation consensus is to put this project on Hold.

6. FINAL REPORT, *TR-659, "Development of Asphalt Modules Master Curve using Falling Weight Deflectometer (FWD) Measurements", Halil Ceylan, ISU/InTrans, ($49,956).*

BACKGROUND

The new American Association of State Highway and Transportation Officials (AASHTO) Mechanistic-Empirical Pavement Design Guide (MEPDG) and the associated software (AASHTOWare Pavement ME Design, formerly known as DARWin ME) represent a major advancement in pavement design and analysis. The MEPDG employs master curves based on time-temperature superposition principles to haracterize the viscoelastoplastic properties of asphalt concrete (AC) materials.The MEPDG recommends the use of AC dynamic modulus, |E*|, as the design parameter. The standard laboratory procedure for AC dynamic modulus testing requires time and considerable resources.

OBJECTIVE

The objective of this feasibility study was to develop frameworks for predicting AC relaxation modulus (E(t)) or |E*| master curves from routinely collected FWD time history data. According to the theory of viscoelasticity, if AC E(t) is known, |E*| can be calculated (and vice versa) through numerical interconversion procedures.

Motion to Approve by 1st B. Younie. 2nd K. Jones.
Motion carried with 13 Aye, 0 Nay, 0 Abstaining

7. **TR-659 IMPLEMENTATION DISCUSSION:**
   - ✓ Scott Schram is very positive about the results and would like to pursue in taking cores and laboratory testing. Scott would like to hold off on the next phase until the laboratory testing is done.
   - ✓ The next proposal to bring to the board is the funding source for the taking cores and laboratory testing. If we decide to pursue another phase then we will come back to the board at that time.

8. **FINAL REPORT,** *TR-663, "Stadard for Single Span Prefabricated bridges-Phase 1-Concept Development", Phil Rossbach, PE, HDR*

BACKGROUND

In coordination with a Technical Advisory Committee (TAC) consisting of County Engineers and Iowa DOT representatives, the Iowa DOT has proposed to develop a set of standards for a single span prefabricated bridge system for use on the local road system. The purpose of the bridge system is to improve bridge construction, accelerate project delivery, improve worker safety, be cost effective, reduce impacts to the travelling public by reducing traffic disruptions and the duration of detours, and allow local forces to construct the bridges.

HDR Inc. was selected by the Iowa DOT to perform the initial concept screening of the bridge system. This Final Report summarizes the initial conceptual effort to investigate potential systems, make recommendations for a preferred system and propose initial details to be tested in the laboratory in Phase 2 of the project.

The prefabricated bridge components were to be based on the following preliminary criteria set forth by the TAC. The criteria were to be verified and/ or modified as part of the conceptual development.

- 24' and 30' roadway widths
- Skews of 0o, 15o, and 30o
- Span lengths of 30' – 70' in 10' increments using precast concrete beams
- Voided box beams could be considered
- Limit precast element weight to 45,000 pounds for movement and placement of beams
- Beams could be joined transversely with threaded rods
- Abutment concepts may include precast as well as an option for cast-in-place abutments with pile foundations

Motion to Approve by 1st P. Assman. 2nd L. Roehl
Motion carried with 13aye, 0 nay, 0 abstaining.

9. **DISCUSSION**

   Q. We have used sections that are welded together, is that a proprietary system?
   A. It is a proprietary system.

10. **PROPOSAL**, *"Context sensitive Designs: Testing of Multi-Performance Level Box Beam Standards", Brent Phares, ISU/InTrans, ($93,565)*

BACKGROUND

Adjacent concrete box beam bridges constitute more than 15% of bridges built or replaced each year. This type of bridge is generally constructed by placing box beams next to one another, grouting a shear

key, applying a transverse post-tensioning force, and then placing either a thin (~3-in.) wearing surface or a thick (~6-in.) structural deck. In some cases, the top of the box beams are left bare to serve as the riding surface. These bridges are attractive because of their relatively shallow superstructure depth, ease of construction, and simple aesthetic attributes.

Adjacent precast, prestressed box beam bridges have been used by multiple Departments of Transportation (DOT) with varying levels of success. Historically, these, and other similar adjacent precast elements, have suffered from differential displacements, which cause cracking in adjoining joint material (or, in some cases, cast-in-place topping material). Sources of differential deflection can come from a variety of conditions including live loads, temperature effects, and others. Generally, these reflective cracks in-and-of themselves do not pose a safety hazard. However, these cracks provide a direct path for water (plus chlorides) to enter the structural system causing corrosion of the mild and prestressing steel. Ultimately, this situation can lead to significant maintenance costs and/or safety concerns. Some early users of adjacent box beams now only allow them on low-volume roads where salt application does not occur.

OBJECTIVE

The objective of the project is to provide information on how two performance level box beam concepts will perform by:

- Conducting on-site inspections of two box beam bridges previously constructed on the Iowa county road system.
- Conducting laboratory testing of drip edge details important to the performance of the Level III concept.
- Conducting laboratory testing of two potential Level II connection details.

Motion to approve by 1st K. Jones. 2nd A. Abu-Hawash
Motion carried with 13 aye, 0 nay, 0 abstaining.

DISCUSSION

Q. Do we understand how non ultra we can be and still be effective?
A. No we do not, the issue with the joints is the shrinkage of the material you put there, any shrinkage is bad.
Q. Do you think ultra-high performance concrete joints are practical in Iowa?
A. This is what we are trying to find out. There is an opportunity if we get enough funding to do 10 bridges, the funding would offset the cost of the ultra-high concrete and this would give us an idea the cost on a standard basis.
Q. Could we come up with a mixing system that would be practical maybe a yard per keyway?
A. Someone could buy one of these mixers and give to the county to share.

11. PROPOSAL, *"Standard for Single Span Prefabricated Bridges-Final Phase III", Phil Rossback, PE, HDR Engineering, ($522,896).*

BACKGROUND

The development of single-span prefabricated bridge standards had been divided into 3 phases. Phase I was development of the concept, phase II is the testing of certain elements on the proposed designs, and Phase III is the development of the actual standards.

OBJECTIVE

The objective of this project is to focus on refinement of the concept from phase I, some additional parametric studies and final design/development of the standards. This includes:

- Parametric studies of span vs. structure type
- Reinforced Concrete Beam Design
- Prestressed Concrete Beam Design
- Cast-in-place Abutment Design
- Precast Concrete Abutment Design
- Development of Standards and Drafting

Motion to approve by 1st P. Assman. 2nd L. Roehl
Motion carried with 13 aye, 0 nay, 0 abstaining.

DISCUSSION

Q. Is there a prioritization for the need for the various standards of the proposal as far as the application?
A. No, this was developed based on needs. For the shorter span bridges the County felt they would like standards to cover these shorter bridges.

Q. Is there an optimization for the need for the amount being spent?
A. This will be a great asset for counties, multiple county bridges fit in this category. If you divide the cost between all 99 counties the money is very insignificant.

12. NEW BUSINESS

- ✓ We will present Mark Dunn with a certificate of appreciation for his years as Secretary at our September IHRB Meeting.
- ✓ For a previous project on compiling legal opinions pertaining to road issues, the AG's office has requested a meeting with county board members to discuss the scope of the project. Vanessa will set up a meeting and facilitate discussion.

13. ADJOURN

The next meeting of the Iowa Highway Research Board will be held Friday, September 26, 2014, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 9 a.m.

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Vanessa Goetz, IHRB Secretary